

CLAIMS

What is claimed is:

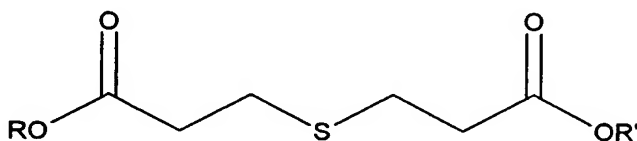
1. A composition comprising lubricant and at least a first antioxidant and a second antioxidant, the first antioxidant being a hindered phenolic and the second antioxidant being a thioether.

2. The composition of claim 1 wherein the first antioxidant is selected from the group consisting of 2,4-dimethyl-6-octyl-phenol; 2,6-di-t-butyl-4-methyl phenol (i.e., butylated hydroxy toluene); 2,6-di-t-butyl-4-ethyl phenol; 2,6-di-t-butyl-4-n-butyl phenol; 2,2'-methylenebis(4-methyl-6-t-butyl phenol); 2,2'-methylenebis(4-ethyl-6-t-butyl phenol); 2,4-dimethyl-6-t-butyl phenol; 4-hydroxymethyl-2,6-di-t-butyl phenol; n-octadecyl-beta(3,5-di-t-butyl-4-hydroxyphenyl)propionate; 2,6-dioctadecyl-4-methyl phenol; 2,4,6-trimethyl phenol; 2,4,6-triisopropyl phenol; 2,4,6-tri-t-butyl phenol; 2-t-butyl-4,6-dimethyl phenol; 2,6-methyl-4-didodecyl phenol; tris(3,5-di-t-butyl-4-hydroxy isocyanurate, tris(2-methyl-4-hydroxy-5-t-butylphenyl)butane; octadecyl-3,5-di-t-butyl-4-hydroxy hydrocinnamate; tetrakis{methylene(3,5-di-t-butyl-4-hydroxy-hydrocinnamate)}methane; 2,2'-oxamido bis{ethyl-3-(3,5-di-t-butyl-4-hydroxyphenyl)}propionate; 1,2-bis(3,5-di-t-butyl-4-hydroxyhydrocinnamoyl)hydrazine; 1,3,5-tris(3,5-di-t-butyl-4-hydroxybenzyl)-s-triazine-2,4,6-(1H,3H,5H)trione; 1,3,5-tris(4-t-butyl-3-hydroxy-2,6-dimethylbenzyl)-s-triazine-2,4,6-(1H,3H,5H)trione; 1,3,5-trimethyl-2,4,6-tris(3,5-di-t-butyl-4-hydroxybenzyl)benzene; 3,5-di-t-butyl-4-hydroxyhydrocinnamic acid triester with 1,3,5-tris(2-hydroxyethyl)-5-triazine-2,4,6-(1H,3H,5H)-trione; bis(3,3-bis(4-hydroxy-3-t-butylphenyl)butanoic acid)glycolester;

- 17 tetrakis{methylene (3,5-di-t-butyl-4-hydroxy-hydrocinnamate)}methane; and 1,3,5-trimethyl-
18 2,4,6-tris(3,5-di-t-butyl-4-hydroxybenzyl)benzene.

1 3. The composition of claim 1 wherein the first antioxidant is butyl-3-(3,5-di-tert-butyl-4-
2 hydroxyphenyl)propionate.

1 4. The composition of claim 1 wherein the second antioxidant is a dialkyldithiopropionate
2 of the structure:



7 wherein R and R' are independently selected from the group consisting of straight chain and
8 branched chain alkyl groups.

1 5. The composition of claim 1 wherein the second antioxidant is
2 ditridecyldithiopropionate.

1 6. The composition of claim 1 wherein the ratio the first antioxidant to the second
2 antioxidant is in the range of from about 70:30 to about 30:70.

1 7. The composition of claim 1 further comprising at least one additional additive selected
2 from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal
3 deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers,
4 VI improvers, and pour point depressants.

1 8. The composition of claim 1 wherein the lubricant is a lubricating oil.

1 9. A composition comprising:

2 A) a lubricant;

3 B) butyl-3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate;

4 C) ditridecyldithiopropionate; and, optionally,

5 D) at least one additional additive selected from the group comprising dispersants,

6 detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants,

7 friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants;

8 wherein the ratio the butyl-3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate to the

9 ditridecyldithiopropionate is in the range of from about 70:30 to about 30:70.

1 10. The composition of claim 9 wherein the lubricant is a lubricating oil.

1 11. A method of increasing the oxidation stability of a lubricant comprising adding thereto

2 at least a first antioxidant and a second antioxidant, the first antioxidant being a hindered

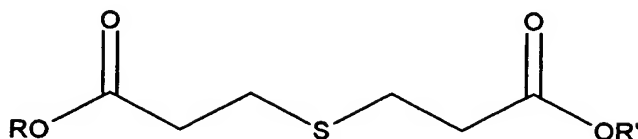
3 phenolic and the second antioxidant being a thioether.

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12. The method of claim 11 wherein the first antioxidant is selected from the group consisting of 2,4-dimethyl-6-octyl-phenol; 2,6-di-t-butyl-4-methyl phenol (i.e., butylated hydroxy toluene); 2,6-di-t-butyl-4-ethyl phenol; 2,6-di-t-butyl-4-n-butyl phenol; 2,2'-methylenebis(4-methyl-6-t-butyl phenol); 2,2'-methylenebis(4-ethyl-6-t-butyl phenol); 2,4-dimethyl-6-t-butyl phenol; 4-hydroxymethyl-2,6-di-t-butyl phenol; n-octadecyl-beta(3,5-di-t-butyl-4-hydroxyphenyl)propionate; 2,6-dioctadecyl-4-methyl phenol; 2,4,6-trimethyl phenol; 2,4,6-triisopropyl phenol; 2,4,6-tri-t-butyl phenol; 2-t-butyl-4,6-dimethyl phenol; 2,6-methyl-4-didodecyl phenol; tris(3,5-di-t-butyl-4-hydroxy isocyanurate, tris(2-methyl-4-hydroxy-5-t-butylphenyl)butane; octadecyl-3,5-di-t-butyl-4-hydroxy hydrocinnamate; tetrakis{methylene(3,5-di-t-butyl-4-hydroxy-hydrocinnamate)}methane; 2,2'-oxamido bis{ethyl-3-(3,5-di-t-butyl-4-hydroxyphenyl)}propionate; 1,2-bis(3,5-di-t-butyl-4-hydroxyhydrocinnamoyl)hydrazine; 1,3,5-tris(3,5-di-t-butyl-4-hydroxybenzyl)-s-triazine-2,4,6-(1H,3H,5H)trione; 1,3,5-tris(4-t-butyl-3-hydroxy-2,6-dimethylbenzyl)-s-triazine-2,4,6-(1H,3H,5H)trione; 1,3,5-trimethyl-2,4,6-tris(3,5-di-t-butyl-4-hydroxybenzyl)benzene; 3,5-di-t-butyl-4-hydroxyhydrocinnamic acid triester with 1,3,5-tris(2-hydroxyethyl)-5-triazine-2,4,6-(1H,3H,5H)-trione; bis(3,3-bis(4-hydroxy-3-t-butylphenyl)butanoic acid)glycolester; tetrakis{methylene (3,5-di-t-butyl-4-hydroxy-hydrocinnamate)}methane; and 1,3,5-trimethyl-2,4,6-tris(3,5-di-t-butyl-4-hydroxybenzyl)benzene.

13. The method of claim 11 wherein the first antioxidant is butyl-3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate.

1 14. The method of claim 11 wherein the second antioxidant is a dialkyldithiopropionate of
2 the structure:



7 wherein R and R' are independently selected from the group consisting of straight chain and
8 branched chain alkyl groups.

1 15. The method of claim 11 wherein the second antioxidant is ditridecyldithiopropionate.

1 16. The method of claim 11 wherein the ratio the first antioxidant to the second
2 antioxidant is in the range of from about 70:30 to about 30:70.

1 17. The method of claim 11 further comprising at least one additional additive selected
2 from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal
3 deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers,
4 VI improvers, and pour point depressants.

1 18. The method of claim 11 wherein the lubricant is a lubricating oil.

- 1 19. A method comprising:
- 2 A) a lubricant;
- 3 B) butyl-3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate;
- 4 C) ditridecyldithiopropionate; and, optionally,
- 5 D) at least one additional additive selected from the group comprising dispersants,
- 6 detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants,
- 7 friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants;
- 8 wherein the ratio the butyl-3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate to the
- 9 ditridecyldithiopropionate is in the range of from about 70:30 to about 30:70.

- 1 20. The method of claim 19 wherein the lubricant is a lubricating oil.